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EXAMINER	
DOLAN, JENNIFER M	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 02/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/089,017	WIRTH ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *22-24* is/are allowed.

6)☒ Claim(s) *1-4 and 6-21* is/are rejected.

7)☒ Claim(s) *5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4 and 6-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,779,924 to Krames et al. (cited by applicant) in view of U.S. Patent No. 5,309,001 to Watanabe et al.

Regarding claims 1-4, 8-12, 14, 19, 20, and 21, Krames discloses a light emitting diode, comprising: a semiconductor layer structure including a substrate (3) and at least one light-generating layer (2) formed on the substrate (figure 7c). Krames further discloses a transparent semiconductor epitaxial layer (1) deposited on the light generating layer (figure 7c), the top surface of the semiconductor epitaxial layer having vertical structuring to improve the decoupling of light (figure 7c; see column 3, lines 1-20; column 6, lines 25-52); a first electrical contact layer (4) on the back of the substrate (see figure 7c), and a second electrical contact layer (4, portion on top of layer 1) deposited directly on the semiconductor epitaxial layer. The semiconductor epitaxial layer (1) of Krames is considered to act as a current-spreading layer, since the current-spreading layer is typically a thin, doped, semiconductor layer with low resistivity, such as an AlGaAs layer, similar to that disclosed by Krames. Assuming arguendo, the epitaxial layer of Krames does not constitute a current spreading layer.

Krames further fails to disclose that the second electrical contact has a lateral structure and provides substantially uniform coupling of the current into the current spreading layer.

Watanabe discloses a light emitting diode including the light emitting layer (91-93), first electrical contact layer (97) on the back of the substrate (90), a current spreading layer (94) and an electrical contact structure (layers 95 and 96 in figures 1-2, for example), comprising a lateral structure (see figures 1-4) with a circular (figure 2) or square shaped (figure 4) central contact surface (98) directly disposed on the current spreading layer (figure 1; column 1, lines 25-64) and a circumferential contact web (99 in figure 2, for example) being continuous and having rotational symmetry represented by a whole number and matching the symmetry of the LED (see figure 2), such that the current is coupled through the middle of the current spreading layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the LED structures of Krames and Watanabe, such that it includes a current spreading layer and an upper electrode with a lateral structure for uniform current coupling, as taught by Watanabe and the vertical structuring taught by Krames. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a current spreading layer and an electrode having a central contact surface and a lateral web structure, because combination of the current spreading layer and laterally disposed electrode structure allows for a substantially even current distribution across the entire LED emissive surface, which results in improved luminous efficiency and brightness (see Watanabe, column 1, lines 15-64), and a person skilled in the art would further desire the vertical structuring, because Krames shows that texturing the outermost layer leads to improved transmission/extraction efficiency of the LED (see Krames, column 2, line 65 – column 3, line

20). The Examiner notes that in the case where epitaxial layer (1) of Krames is considered to act as a current spreading layer, then it would be obvious based on Watanabe to simply provide lateral structuring to the contact layer already present in Krames, since Watanabe clearly indicates that use of a laterally structured contact electrode in place of a non-laterally structured contact electrode vastly improves the luminous efficiency and light extraction (see Watanabe, columns 1-3).

The Examiner notes that Watanabe discloses the embodiment having the central contact portion directly contacting the current spreading layer as a less optimal arrangement for evenly distributing current than embodiments using a dielectric spacer between the central contact surface and the current spreading layer (see Watanabe, column 1, lines 55-64; columns 3-4). The Applicant, however, is reminded that "a known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use" (In re Gurley, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)), and that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. (Merck & Co. v. Biocraft Laboratories, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). See also Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998) (The court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed.") See MPEP § 2123. Since the applicant provides no specific unexpected result or specific advantage to having the central contact structure directly contact the current spreading layer, and

since such an arrangement is clearly known in the art (see column 1 of Watanabe), the usage of such a structure would have been reasonably suggested to a person skilled in the art based on the disclosure of Watanabe.

Regarding claims 6, 17, and 18, Krames, as modified by Watanabe, discloses that the second electrical contact layer (Krames, 4,9 adjacent to layer 1) is arranged on vertically structured (see Krames, figs. 9-11) and/or unstructured portions of the current spreading layer (Krames, figure 7c).

Regarding claims 7 and 13, Krames discloses that the vertical structuring is in the form of regularly arranged cones (column 6, lines 25-30; figures 5a-5c). Krames further teaches that both "sharp featured" and "soft featured" textures are known to the art (column 4, lines 28-47).

Krames fails to specifically disclose the use of pyramidal texturing.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the texturing of Krames as modified by Watanabe, such that the texturing includes pyramids. The rationale is as follows: A person having ordinary skill in the art would have been motivated to use pyramids, because a pyramidal structure is the "sharp feature" analogous form to the specifically disclosed cones (see column 6, lines 25-30; figures 5a-5c). Although Krames teaches that the "sharp feature" forms are less desirable than the "soft feature" forms, it is quite apparent to a person skilled in the art that the use of both the "soft" and "sharp" forms are contemplated by Krames. It has been held that "A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including

nonpreferred embodiments, " *Merck & Co. V. Biocraft Laboratories*, 874 F .2d 804 10 USPQ 2d (1843). Also, it has been held that "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use," *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (1994). Since the applicant provides no specific unexpected result or specific advantage to using pyramids over using cones, and since pyramids are an obvious "sharp featured" analogous structure to regularly arranged cones, their usage as a textured layer for improved light extraction would have been reasonably suggested to a person skilled in the art based on the disclosure of Krames.

Regarding claims 15 and 16, Krames discloses that the vertical structuring is in the form of regularly arranged cones (column 6, lines 25-30; figures 5a-5c).

Allowable Subject Matter

3. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims for reasons deemed to be of record.

4. Claims 22-24 are allowed for reasons deemed to be of record.

Response to Arguments

5. Applicant's arguments filed 11/25/05 have been fully considered but they are not persuasive.

The Applicant primarily argues that the references teach away from their combination, and thus, cannot be used for a 35 U.S.C. 103(a) rejection.

This is not persuasive for the following reasons: First, in the case where the AlGaAs epitaxial layer (1) in Krames is taken as a current spreading layer, the combination of Krames and Watanabe is merely a substitution of a laterally structured contact layer/electrode for the non-structured electrode in Krames. Since Watanabe clearly indicates that it is preferable to use a laterally structured electrode over a non-laterally structured electrode in order to improve the light extraction/luminous efficiency of the device (see Watanabe, columns 1-3), the Examiner maintains that a person having ordinary skill in the art would have ample motivation for using the laterally structured electrode, and hence, be led toward – and not away from- combining this laterally structured electrode of Watanabe with the LED device of Krames.

In the case where Watanabe is taken as supplying the current spreading layer and the electrode layer, the Examiner agrees that Watanabe indicates that the current spreading layer is well known and often used in the art to prevent the current from concentrating underneath the surface electrode, and thus improve the light extraction of the device (Watanabe, column 1, lines 50-64), but that the presence of the current spreading layer causes the detrimental effect of some absorption of light when the LED emits at wavelengths smaller than the absorption edge of the material of the current spreading layer (see Watanabe, column 1, line 65-column 2, line 4). Watanabe then suggests a solution of providing sufficient branching and structure of the lateral electrode to permit relatively even current distribution, and thus render the current spreading layer unnecessary (see Watanabe, column 3). Thus, while Watanabe indicates that the most preferred embodiment would have a very highly laterally structured electrode and no current

spreading layer, due to the lack of absorption of smaller wavelength light, the less-preferred embodiment of Watanabe, including a less highly laterally structured electrode and a current spreading layer, would still be superior to an electrode having no lateral structure at all, as in Krames.

If Watanabe were being relied upon for adding only a current spreading layer to a semiconductor LED already having a laterally structured electrode, the Examiner might agree that Watanabe could be considered to teach away from the combination. Since the combination of Krames and Watanabe, however, is the replacement of a non-structured electrode with the structured-electrode and current spreading layer in Watanabe, and since Watanabe clearly shows that even the non-preferred embodiment including the current spreading layer and the laterally structured electrode provides a significant and tangible improvement over the case in Krames, using the non-structured electrode, the Examiner maintains that the combination of Watanabe and Krames, as relied upon in the rejection supra and in view of *In re Gurley* (27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)) is proper.

The Examiner notes that the Applicant has provided no specific unexpected result or specific advantage for using a current spreading layer with the structured electrode, nor has the Applicant even provided any indication that such an arrangement is anything other than that already well-known in the art. The Examiner further notes that the disadvantage in using a current spreading layer set forth in Watanabe only applies to diodes having an emission wavelength smaller than the absorption edge of the current spreading layer, and thus, would not necessarily even apply to the structure of Krames. For Example, in the case of the diode structure of figure 2 of Krames, using an AlGaAs current spreading layer and GaAs active

material, the light emission should be in the vicinity of 850 nm, and thus would not be absorbed by the AlGaAs layer. In this case, there would be no reason to remove or omit the current diffusion layer.

The Applicant further argues that Watanabe does not disclose a circumferential web. This is not persuasive, because Watanabe illustrates that the contact structure includes a dense, intricate, interconnected pattern crossing the entirety of the upper surface of the device and arranged about the circumference or periphery of the central contact portion. Thus, the Examiner considers such an arrangement to be a "circumferential web." The Applicant's specification as well as any conventional understanding of the term "circumferential" does not require some sort of concentric ring arrangement, as appears to be implied by the Applicant on page 3 of the 11/25/05 Remarks.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd

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